

ASC-TR-96-1000

LITELINE 360™ PRODUCT EVALUATION REPORT

AD-A286 858



Aeronautical Systems Center
Weapons, Air Base and Range Product Support Office
ASC/VXO
314 W. Choctawhatchee Ave., Suite 104
Eglin AFB, FL 32542-5717

3 January 1996

FINAL REPORT FOR PERIOD 8 DEC 1994 - 31 JUL 1995

96 2 23 010

96-00420



A-1

Distribution A: Approved for public release; distribution unlimited.

AERONAUTICAL SYSTEMS CENTER

Air Force Material Command ■ United States Air Force ■ Eglin Air Force Base

NOTICE

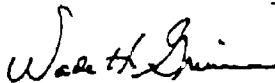
This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any employees, nor any of their contractors, subcontractors, or their employees, make any warranty, expressed or implied, or assume any legal liability or responsibility for the accuracy, completeness, or usefulness of any privately owned rights. Reference herein to any specific commercial product, process, or other service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency, contractor, or subcontractor thereof. The views and opinions of the authors expressed herein do not necessarily state or reflect those of the United States Government or any agency, contractor, or subcontractor thereof.

When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely Government-related procurement, the United States Government incurs no responsibility or any obligation whatsoever. The fact that the Government may have formulated or in any way supplied the said drawings, specifications, or other data, is not to be regarded by implication, or otherwise as in any manner construed, as licensing the holder, or any other person or corporation; or as conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

This technical report has been reviewed by the Public Affairs Office (PA) and is approved for public release; distribution is unlimited.

This report has been reviewed and is approved for publication.

FOR THE COMMANDER



WADE H. GRIMM
Program Manager

Please do not request copies from the Aeronautical System Center, Weapons, Air Base and Range and Product Support Office (ASC/VXO). Address your request for additional copies to:

Defense Technical Information Center
8725 John J. Kingman Road
Ft Belvoir, VA 22060-6218

If your address has changed, if you wish to be removed from our mailing list, or if your organization no longer employs the addressee, please notify ASC/VXO, 314 W. Choctawhatchee Ave., Suite 104, Eglin AFB FL 32542-5717, email: grimmw@eglin.af.mil, DSN 872-4695, ext 321, (904) 882-4695, ext 321 to help us maintain a current mailing list.

Do not return copies of this report unless contractual obligations or notice on a specific document requires that it be returned.

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE 3 January 1996		3. REPORT TYPE AND DATES COVERED Final, 8 Dec 1994 - 31 Jul 1995	
4. TITLE AND SUBTITLE LITELINE 360™ PRODUCT EVALUATION REPORT				5. FUNDING NUMBERS PE: 64708F	
6. AUTHOR(S) Hoyd O. Sanders, Jr., TSgt William Fischer, Wade H. Grimm, Stephen E. Kelley					
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) 325 CES/CEF 119 Alabama Ave. Tyndall AFB, FL 32403-5014				8. PERFORMING ORGANIZATION REPORT NUMBER Unit 5104 Yokota AB APO AP 96328-5104	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Aeronautical System Center Weapons, Air Base and Range, Product Support Office (ASC/VXO) 324 Choctawhatchee Ave., Suite 104 Eglin AFB, FL 32542-5717				10. SPONSORING/MONITORING AGENCY REPORT NUMBER ASC-TR-96-1000	
11. SUPPLEMENTARY NOTES					
12a. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution is unlimited				12b. DISTRIBUTION CODE A	
13. ABSTRACT (Maximum 200 words) Final report of the commercial technology exploitation evaluation of the LiteLine 360™ portable light rope produced by Flexlite Inc. of Edison, New Jersey. The evaluation was conducted by the 325 CES, Fire Protection Division, Tyndall AFB, Florida and the 374 CES Fire Protection Division, Yokota Air Base, Japan between 8 Dec 1994 and 31 Jul 1995. This evaluation was part of a continuing program to explore commercial off the shelf technology for application to Air Force firefighting requirements. The LiteLine 360™ is an illuminated length of flexible tubing (100, 200, and 300 foot lengths) that can assist firefighters during ingress to a structure or aircraft and egress of injured or trapped personnel/passengers. The item was highly visible, even in dense smoke environments. It helped free both hands for fire and rescue operations where a flashlight/lantern normally would occupy one hand. The item enhanced fire/rescue capabilities and has been recommended for addition to table of allowance 490, making it available to Air Force fire departments worldwide.					
14. SUBJECT TERMS LITELINE 360, LIGHT ROPE, SEARCH AND RESCUE, FIRE/RESCUE, CONFINED SPACE, SAFETY LINE.				15. NUMBER OF PAGES 9	
				16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT SAR		

THIS PAGE INTENTIONALLY LEFT BLANK



DEPARTMENT OF THE AIR FORCE

AERONAUTICAL SYSTEMS CENTER (AFMC)

EGLIN AIR FORCE BASE, FLORIDA

3 Jan 96

MEMORANDUM FOR HQ AFCEA/CEXF

FROM: ASC/VXO
314 Choctawhatchee Ave., Suite 104
Eglin AFB, FL 32542-5717

SUBJECT: LiteLine 360™ Product Evaluation Report
(Ref: Test Plans, 14 Oct 94 and 30 Jan 95)

1. PURPOSE AND BACKGROUND. The purpose of this test was to assess the effectiveness and suitability of the LiteLine 360™ portable light rope manufactured by Flexlite Inc. The product is an illuminated length of flexible tubing that can assist firefighters during ingress to a structure or aircraft and egress of injured or trapped personnel and passengers from buildings, Air Force cargo and passenger aircraft. The goal is to provide illumination for firefighter activities as well as a lighted escape route for all personnel. The evaluation was managed by the 325 CES/CEF at Tyndall AFB, Florida and 374 CES/CEF at Yokota AB, Japan between 8 Dec 94 and 31 Jul 95.

2. SYSTEM DESCRIPTION. The LiteLine 360™ is electrically powered from wall outlet, fire truck auxiliary generator, or battery source depending upon the version purchased. The 120 or 220 VAC units are available in 100, 200 and 300 foot lengths while 12 VDC units are available in 60 or 90 foot lengths and 24 VDC versions come in 120 and 180 foot lengths. The light rope uses long life (10,000 hrs) bulbs spaced 1 inch apart, encased in a ½ inch diameter waterproof PVC tube, weighing 12 pounds per 100 foot length. The bulbs are wired so that damage to one will only darken a 40 inch segment. The LiteLine 360™ normally has a single male end plug, but three 100 foot segments with end-to-end plug together capability were also evaluated. The LiteLine 360™ can be employed anywhere an extension cord would be used for a portable light. The line is normally stowed in a canvas bag and can be deployed trailing behind a firefighter or thrown ahead of him as one would deploy a life preserver. The 120 VAC units draw 4.5 amps in the 100 foot version, 9.3 amps in the 200 foot version, and 14 amps in the 300 foot version.

3. METHOD. The LiteLine 360™ was added to fire/rescue vehicles at both locations and used as appropriate during actual and training scenarios. Appropriate applications of the LiteLine 360™ were left to the resourcefulness of the respective fire/rescue units evaluating the product. Since the LiteLine 360™ is unlike any of the tools currently in the firefighters

inventory, uses, applications and techniques for employment is an evolving process. Methods and applications used varied between evaluation sites.

4. OBJECTIVES AND RESULTS. The following objectives were used to assess effectiveness, compatibility, reliability, maintainability, and availability of the LiteLine 360™ light rope when used to provide fire/rescue personnel assistance in structure and aircraft actual and training situations.

a. Objective E-1. Assess the effectiveness of the LiteLine 360™ to provide illumination and safe access to buildings and aircraft during training and emergency response scenarios. The measure of effectiveness is time saved getting portable lighting to the location of a fire/rescue and getting firefighter personnel safely into and out of the emergency environment. The criteria is not established. **Results:**

(1). Visibility of the LiteLine 360™ in even the most dense smoke filled environments was reported as incredible. It would illuminate the exit route, highlight other fire fighters to reveal their location/activities and aided in determining the location of injured or entrapped victims. During search and rescue operations it would not replace the use of portable flashlights/lanterns, but would enhance orientation in the fire/rescue surroundings and provide an unmistakable safe route of egress.

(2). During ladder operations, the 200 foot length would be attached to the top rung of a ladder. Once raised, the LiteLine 360™ provided more than adequate light for safe climbing on the ladder. For window or roof entry, several feet of the LiteLine 360™ would be pulled beyond the ladder to mark the exit location. When ventilation operations were conducted in roof areas, the LiteLine 360™ was superb to highlight the ventilation holes and prevent accidental entanglement.

(3). The LiteLine 360™ provided extremely effective illumination during cargo (C-5 and C-141) aircraft exercises. During fighter egress exercises the LiteLine 360™ was most effective in identifying entry control points, re-servicing areas and medical treatment areas. Due to the limited space in a fighter cockpit, flashlights were the preferred illumination device due to concern that the LiteLine 360™ could get entangled in an ejection handle or other cockpit levers/handles.

(4). The measure of time saved compared to traditional portable lighting was not an appropriate evaluation criteria. In fire/rescue scenarios, hand held flashlights/lanterns are the typical source of illumination. While they are quick to deploy, they require constant attention (aiming) and by occupying one hand are a hindrance during victim removal and fire fighting operations. Although the LiteLine 360™ takes a couple minutes to fully deploy it provides much better illumination of the work area and operates unattended.

(5). The 100 foot LiteLine 360™ was too short for most scenarios, especially when the illuminated segment started at the vehicle (auxiliary generator). The 200 foot length was preferred as more useable for a variety of exercises. The ability to lengthen by addition of 100 foot segments as needed provided true flexibility to respond to nearly any situation. By using a separate extension chord, firefighters were able to place the beginning of illumination where it was most beneficial and not waste lighted segments outside a structure.

(6). The LiteLine 360™ was normally deployed from a rope bag and could tangle on itself. At low ambient temperatures, the LiteLine 360™ was initially stiff, but if it was plugged in just prior to deploying, it would warm sufficiently to be adequately flexible. Storage on a reel would provide smoother deployment, but the entire line must be removed from the reel to prevent damage from heat build-up of overlapping coils on the reel.

b. Objective S-1. Assess the compatibility of the LiteLine 360™ with the operational environment. Can the system provide timely response in an emergency scenario? Is there adequate power available from vehicles in the emergency response team to employ the light? What problems are encountered deploying the light rope? Does it interfere with any other equipment normally used in an aircraft or structure emergency response? The measure of effectiveness is a subjective evaluation of interoperability with other emergency response equipment and personnel. The criteria is not established. **Results:**

(1). The LiteLine 360™ could be fully deployed by a single individual in 1 to 2 minutes.

(2). The generators installed on vehicles are rated at 5200 watts, more than adequate for even a 300 foot LiteLine 360™ (120v X 14a = 1680 watts).

(3). Occasionally the power cable became unplugged from the power source which could be prevented by a "tie off" combined with a twist locking electrical plug.

(4). A hook at the end of the LiteLine 360™ would enhance deployment by allowing attachment to a ladder or the belt of a firefighter that leads into the interior of a structure or aircraft.

c. Objective S-2. Assess the reliability, maintainability, and availability (RM&A) of the LiteLine 360™. The measure of effectiveness is serviceability of the unit. The criteria is not established. **Results:**

(1). No electrical or maintenance problems were experienced by either evaluation site during the period of evaluation.

(2). The units are easy to clean with mild soap and water and retained a like new appearance.

(3). No nicks, cuts or severe abrasions in the PVC sheathing were noted by one site while only minor scratches and abrasions were noted at the other site after dragging through mud, paved roads and gravel.

(4). All bulbs were reported still operating at the end of the evaluation. A damaged unit with inoperative segments can be repaired by the manufacturer or a competently trained electrician (to maintain the waterproof characteristics).

5. CONCLUSIONS. The LiteLine 360™ provides much needed illumination during fire fighting operations in structures, aircraft and confined spaces. Although vehicle lights provide more illumination on structure exteriors, the LiteLine 360™ provides unique lighting of the interior environment with a glowing safety line. It can free both hands for other firefighting tasks while providing general lighting in the fire scene and a clear indicator of the escape route, even in dense smoke situations. The LiteLine 360™ should be purchased in 100 foot plug together segments (maximum of 300 feet based upon internal wiring) to provide maximum flexibility in a variety of scenarios. Acquired techniques such as coiling to increase light in a localized space and entwining a railing in stairwells enhances the utility of this tool. Users should employ the unit with an extension cord to avoid wasting illumination outside of a structure, aircraft or confined space.

6. RECOMMENDATIONS. This tool should be stock listed and added to Table of Allowance 490 as required. Suggested improvements include:

a. Some type of hook should be available for the end of the LiteLine 360™ to attach to ladders or belt loops. This can be a local modification to accomodate specific requirements.

b. Some form of marking such as arrows on the PVC of the LiteLine 360™ or sequential blinking lights toward the source, would allow a lost firefighter to know which direction he should follow to the exit. (Flexlite Inc. has upgraded their design with two green and a single red light at the end of every 40 inch segment. Red indicates the direction toward the fire and green indicates the direction toward the power source or egress direction.)



WADE H. GRIMM
Program Manager

Attachment:

1. Product Illustration.
2. Distribution.

1st Ind to ASC/VXO LiteLine 360™ Product Evaluation Report

HQ AFCESA/CEXF

26 Jan 96

Concur/~~non-concur~~ with the recommendations in this report.


JAMES W. HOTELL
Chief, Fire Protection Division



LifeLine360™

THE BRIGHT NEW IDEA IN FIREFIGHTER SAFETY

LET'S

DEVELOPED BY FIREFIGHTERS, FOR FIREFIGHTERS.

THEM

PROVIDES ILLUMINATED TRAIL IN AND OUT OF BUILDING.

SEE

DEPLOYS LIKE ROPE. LIGHTWRIGHT AND FLEXIBLE.

THE

USE





LiteLine360™

THE BRIGHT NEW IDEA IN FIREFIGHTER SAFETY

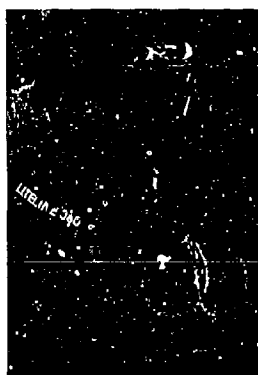
GOES EVERYWHERE WITH THE FIREFIGHTER.

LiteLine 360 is a breakthrough in firefighter safety. Lightweight, flexible, and easy to carry and deploy, LiteLine 360 is a light source that goes everywhere and lights everywhere it goes. Simple as a series of small bright lamps in clear PVC sheathing, it's tough enough for use in moderately hostile firefighting conditions. If the firefighter can be there, so can LiteLine 360.

Once deployed, LiteLine 360 becomes an *easy-to-follow route* to people and areas inside the structure. With it, firefighters can *move and work more quickly*. And most important, LiteLine 360 provides an *illuminated path of retreat*: it lights the way to safety.



A - 1.2



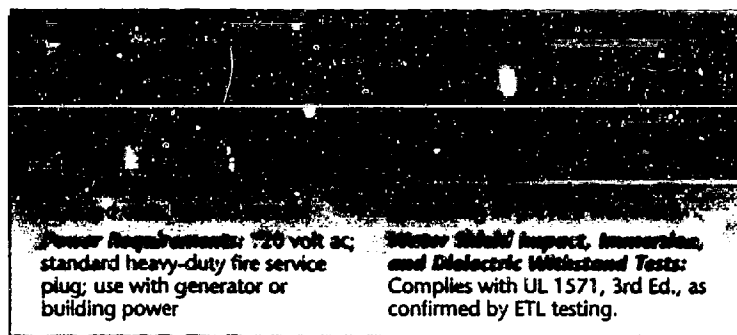
Flexible LiteLine 360 deploys on the go from available canvas bag.

IMPROVES FIREFIGHTERS' ABILITY TO SEE.

Light is critical to fire service operations. Now with LiteLine 360 firefighters can have better illumination for working in de-energized and smoke-infiltrated structures. LiteLine 360 furnishes a moderate ambient light level everywhere it's deployed. Rather than a limited point source and beam, it's a *continuous strand of omni-directional light*: helpful illumination in "360 degrees" around the source.

A HIGHLY FUNCTIONAL PORTABLE LIGHTING APPLIANCE.

- **Goes everywhere** — Makes firefighter's job safer and easier during the crisis, during salvage-and-overhaul, and on search-and-rescue missions.
- **Carry while lit** — Provides illumination while advancing and immediately marks routes for quick travel in and out.
- **Compact and flexible** — Safe for use in close, confined areas.
- **Fast deployment** — Light whole areas just by draping along floor and over objects.
- **Non-ignition source of illumination** — Can be deployed in environments with flammable gasses.
- **Omni-directional, "360-degree" light** — Better illumination for working in darkened areas, especially smoke-filled environments.



Power Requirements: 120 volt ac; standard heavy-duty fire service plug; use with generator or building power

Water Shield Impact, Immersion, and Dielectric Withstand Tests: Complies with UL 1571, 3rd Ed., as confirmed by ETL testing.

**For More Information
or to Order, Call
800-932-9899.**

In New Jersey: (908) 417-0777

FLEXLITE INC.

102 Fernwood Avenue
Edison, NJ 08837

NOTICE: LiteLine 360 is a portable lighting appliance for firefighting and search-and-rescue applications; it is not intended for use as a rope for hauling or as a lifeline for tying on.

DISTRIBUTION ASC-TR-96-1000

Eglin AFB offices:

ASC/VXO	4	HQ AFMC/CEOO	1
AFDTC/PA	1	Attn: Jim McKay	
WL/MNPM (Technical Library)	1	4225 Logistic Ave., Suite 7	
		WPAFB, OH 45433-5739	
Defense Technical Information Center	2		
Attn: DTIC-DDAC		HQ AFRES/CEXF	1
8725 John J. Kingman Road		Attn: Donald Warner	
Ft Belvoir, VA 22060-6218		155 Second Street	
		Robins AFB, GA 31098-1635	
325 CES/CEF	1		
Attn: Mr. James Stemple		HQ AFSOC/CEF	1
119 Alabama Ave.		Attn: CMSgt Marshall	
Tyndall AFB, FL 32403-5014		204 Bennett Ave.	
		Hurlburt AFB, FL 32544-5270	
374 CES/CEF	1		
Attn: Mr. Sandy Sanders		HQ AFSPC/CEPX	1
Unit 5104		Attn: Sandi Sanchez	
Yokota AB, JA		150 Vandenberg St., Suite 1105	
APO AP 96328-5104		Petterson AFB, CO 80914-4150	
AFCESA/CEXF	1		
Attn: Jim Hotell		HQ AMC/CEOO	1
139 Barnes Drive, Suite 2		Attn: Duane Morgan	
Tyndall AFB, FL 32403-5323		507 A Street	
		Scott AFB, IL 62225-5022	
WR-ALC/LVV	2		
Attn: Sharon Edwards & Mary Zampa		HQ USAFA/CEF	1
225 Ocmulgee Court		Attn: Richard Duncan	
Robins AFB, GA 31098-1647		9224 Airfield Drive	
		Air Force Academy, CO 80840-2080	
ANG/CEXF	1		
3500 Fetchet Ave.		HQ USAFE/RSIXF	1
Andrews AFB, MD 20762-5157		Attn: Ray Porter	
		Unit 3050, Box 10	
		APO AE 09094-5010	
HQ ACC/CEXF	1		
Attn: Randy Caratachea		HQ PACAF/CEOO	1
129 Andrews St., Suite 102		Attn: CMSgt Soto	
Langley AFB, VA 23665-2769		25 E Street, Suite D-306	
		Hickam AFB, HI 96853-5412	
HQ AETC/CEOX	1		
Attn: Fire Protection Manager		Total Copies:	24
266 F Street West			
Randolph AFB, TX 78150-4321			